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SUMMARY

1. PURPOSE. To provide security and policy review on the document at Tab 1 prior to release to the public.

2. BACKGROUND.
Authors: Dr. Nathan Wozny, DFEG, X2086; Dr. Nan Maxwell, Mathematica Policy Research

Title: "Risk Factors Associated with Disability Following Work-related Injuries"

Circle one: Abstract Tech Report Journal Article Speech Paper Presentation Poster Thesis/Dissertation Book Other: ________________

Check all that apply (For Communications Purposes):
[] CRADA (Cooperative Research and Development Agreement) exists
[] Photo/ Video Opportunities [] STEM-outreach Related [] New Invention/ Discovery/ Patent

Description: This study uses administrative data on injury claims filed under the Federal Employees' Compensation Act to examine the risk factors underlying disability after a work-related injury has occurred. The analyses suggest that such risk factors differ across groups, defined by demographics, employment characteristics, and injuries.

Release Information: To be submitted to the Western Economic Association 89th Annual Conference and the Mathematica Working Paper Series.

Previous Clearance information: none

Recommended Distribution Statement: Distribution A: approved for public release, distribution unlimited

3. DISCUSSION. This article does not comment on the policies of USAFA, the Air Force, or the Department of Defense. This study of disability and work-related injuries uses publicly available data from a Federal workers' compensation program, and as such, it contains some statistics on the workers' compensation cases filed by Federal departments, including the Department of Defense. However, the paper's focus on Federal departments is minimal, restricted to differences evident in the publicly available data, and does not present any department in a negative light. The acknowledgements include a disclaimer about the U.S. Department of Labor (DOL) in addition to USAFA, the AF, and the DoD because the data were derived from a Federal contract between DOL and Mathematica Policy Research, a previous employer of Dr. Wozny. However, this article was completed using publicly available data and is not a part of Dr. Wozny's previous employment.

4. RECOMMENDATION. Approve the document as suitable for public release.

Nathan Wozny
Nathan Wozny, PhD, Assistant Professor, DFEG

Tab 1. Copy of article

# Risk Factors Associated with Disability Following Work-related Injuries

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**Abstract**

The high cost of the work-related injuries resulting in a disability has led to an interest in understanding factors associated with a workplace disability. However, data available to identify these risk factors are often limited in detail or narrow in their samples. This study uses a previously untapped data base—administrative data on close to 1 million injury claims filed under the Federal Employees' Compensation Act—to examine the risk factors underlying disability after a work-related injury has occurred. Our analyses suggest that such risk factors differ across groups, defined by demographics, employment characteristics, and injuries. Differences exist in three areas: the probability of incurring an injury, the probability of incurring a disability once an injury has occurred, and the size of the association between a risk factor and the probability of incurring a disability.

*Keywords*: work-related injury, disability, lost productivity, work absence, return to work, Federal Employees' Compensation Act, FECA, loss of earnings

Work-related injuries and illnesses can disrupt quality of life substantially. About 3.9 million American workers sustained a work-related injury in 2011, with about 30 percent missing work as a result (Bureau of Labor Statistics [BLS] 2011a, 2011b).[1] These injured workers[2] might face reduced future job opportunities (Belton 2011) and a rehabilitation period that restricts personal activities and overall lifestyle, and causes social and psychological harm (Kirsh et al. 2012; Banks 1995). Their employers must pay for medical treatments and lost wages and adjust production decisions or recruit and train new employees to replace injured workers (Leigh et al. 2000). Most of these costs are incurred by injuries to a small proportion of injured workers. About 93 percent of the approximately $57.5 million in medical and cash benefits workers' compensation programs paid in 2010 were incurred by one in four injuries (24 percent) (Sengupta et al. 2012).

The high cost of work-related injuries, especially with respect to lost wages and productivity, suggests that understanding the risk factors that might lead to disabilities among workers could help policy makers to build safety nets for injured workers most at risk of diminished earnings; heads of workers' compensation programs to target resources toward cases most likely to need them; and employers with injured workers to plan for replacement workers. Unfortunately, many of the existing studies on risk factors (Table 1) suffer from the use of less than adequate data (Krause et al. 2001). Most importantly, studies have examined risk factors using data on a specific injury type, occupation, or industry, leaving in question the generalizability of the relationships observed to other groups.

This study uses a previously untapped data source, administrative data from the Federal Employees' Compensation Act (FECA), to provide insights into the risk factors associated with experiencing a disability from work-related injuries across a broad range of occupations and injuries. The data describe claims for work-related injuries or illnesses filed by appropriated-fund

[1]These numbers are based on the percentage of injured private sector and state and local government employees who miss days from work. Fourteen percent missed more than 10 days away from work.

[2] We refer to injuries and illnesses collectively as injuries when the distinction is not relevant.

civilian federal employees. Although the data are not representative of injuries among the workforce nationally, the population of eligible employees represents a major portion of the workforce, and the claimants are subject to the same set of incentives to return to work following a work-related injury. This broad and heterogeneous set of claims data provides an opportunity to examine risk factors for disability across different types of individuals, injuries, and employment characteristics.

## I. Framework

The International Classification of Functioning, Disability, and Health (ICF) considers a disability to encompass medical diagnoses as well as how the interaction between the injury and environmental and personal factors limit activities (World Health Organization 2002). In the workplace, such impairments would limit a worker's ability to perform the activities required for the job they performed at the time of the injury. Accordingly, measures of disability associated with work-related injuries frequently focus on lost productivity.

Understanding the factors associated with incurring a disability from a work-related injury[3] requires understanding two sets of probabilities: the probability that an employee becomes injured from work-related activities and the probability that an injury will result in a disability. These two probabilities are generally examined in two separate strands of research (Table 1), a distinction that is mirrored in practice as efforts to prevent work-related injuries and mitigate their negative consequences are often treated separately from efforts to return injured employees to work.

We consider a simple but unified framework that describes the probability that a given work-related injury results in a disability during a specified time. We model the probability of an employee incurring a work-related injury drawing on the literature on incidence rates. That probability varies by demographics, including age, gender, and race/ethnicity (Breslin et al.

[3] Consistent with many data sets, including ours, that track injury cases defined by particular incidents, we refer to a single injury even if the worker sustained multiple injuries during a single incident.

2003; Loomis and Richardson 1998); employment characteristics, including occupation, industry, union representation, hours worked, and tenure (Breslin et al. 2007; Verma et al. 2007; Dembe et al. 2005; Strong and Zimmerman 2005); and work environment, including environmental conditions, policies and programs, and organization and coworker support (DeJoy 2004). Mathematically,

(1) $\Pr(I_i) = f(\mathbf{X}_{1i}, \mathbf{X}_{2i}, \mathbf{X}_{3i})$,

where $I_i$ is the probability that worker *i* sustains a work-related injury in a given time period and the three vectors that describe categories of factors that might affect injury incidence: demographics ($\mathbf{X}_{1i}$) and employment characteristics ($\mathbf{X}_{2i}$), and work environment ($\mathbf{X}_{3i}$).

A more voluminous research examines factors that influence the ability of a worker to return to work after a workplace injury. Risk factors for disability identified by this literature are largely the same as those affecting the occurrence of a workplace injury (Strong and Zimmerman 2005), including demographics (Boden and Galizzi 2003; Cheadle et al.1994; MacKenzie et al. 1987), employment characteristics (Seabury and McLaren 2010; Cheadle et al. 1994; Johnson and Ondrich 1990), and work environment (MacKensie 1998, 1987). In addition, the type and severity of the injury incurred (Liao et al. 2001; MacKenzie et al. 1998; Johnson and Ondrich 1990) and the timeliness in provision of appropriate medical services (Blackwell et al. 2003) underlies whether a worker might return to full productivity at the job held prior to the injury. The probability of worker *i*'s injury leading to a disability ($D_i$) can therefore be modeled as:

(2) $\Pr(D_i)\big|_I = g(\mathbf{X}_{1i}, \mathbf{X}_{2i}, \mathbf{X}_{3i}, \mathbf{X}_{4i}, \mathbf{X}_{5ij})$.

where $\mathbf{X}_{4i}$ captures the type and severity of the injury and $\mathbf{X}_{5i}$ measures the receipt of injury-appropriate services, including medical services or workplace accommodations. Risk factors associated with the probability of a disability following a work-related injury include, gender, age, family characteristics, and race ($X_1$); occupation, industry, experience, and tenure ($X_2$); accommodations made for employee safety and productivity ($X_3$); back upper body, lower body,

fracture, sprain, carpal tunnel and musculoskeletal injury ($X_4$); and vocational rehabilitation, hospitalization, chiropractic, and physical therapy services ($X_5$).

Understanding the relationships in equations (1) and (2) would be extremely valuable. Knowing the nature of the function f in equation (1) could potentially identify methods of reducing injury incidence or compensating workers in particular jobs or industries for the injury risk they assume and knowing the nature of the function g in equation (2) could potentially help identify other ways to reduce disability caused by an injury. Inferring these causal relationships from observational data is difficult or impossible, however, as unobserved factors such as motivation to work might affect the probabilities shown in both equations (1) and (2). Still, observational data can help identify risk factors associated with incurring an injury that results in a disability. By identifying observable risk factors associated with disability, efforts to prevent injuries or reduce their impact on disability could be targeted, even if those risk factors do not have a causal effect on injury incidence or disability after an injury.

Unfortunately, most observational studies examining risk factors face at least three types of data limitations. For one, they rely on data on a specific injury type, occupation, or industry, which requires one to assume that they are the same for other groups if results are to be generalized. Yet, risk factors for incurring a disability may vary by group and these differences are potentially important for targeting resources effectively in workers' compensation programs and company's human resource policies. For example, should risk factors differ by gender it might be effective for workers' compensation programs to tailor service structures for males and females, and companies might consider different programs for offices with female-dominated and male-dominated workforces even if occupational structures were similar. Furthermore, differences in risk factors across groups might provide an explanation for why studies in Table 1 are somewhat inconsistent in showing which risk factors predominate in determining work outcomes following a work-related injury. For example, the type of impairment was a key factor in returning to work in a study of partially disabled workers (Johnson and Ondrich 1990) but was

less important than nonmedical factors (for example, demographics) in a sample of patients in level-I trauma centers (MacKenzie et al. 1998).

For another, studies often lack information for complete model specification of equations (1) and (2) and, potentially, such difficulties might lead researchers to identify risk factors that are correlates for excluded variables. Differences in model specification could be another explanation why studies in Table 1 are somewhat inconsistent in identifying risk factors. For example, research shows that females are generally more prone to injury (Liao et al. 2001) and have greater work absence once injured (Cheadle et al. 1994), yet more complete model specifications can cause such differences to disappear (Boden and Galizzi 2003). In this case, it may be that gender is capturing (that is, proxying for) other risk factors that are not included in estimations when data available for estimation do not have measures of all risk factors.

Finally, available data generally do not allow estimation of both sets of probabilities[4] and often limit estimation of risk factors associated with returning to work for injuries that are reported through workers' compensation or medical center visits (Table 1). As a result, equation (1) cannot be estimated and we cannot gain a complete understanding of the unconditional probability that a worker will incur an injury that leads to a disability. As a result, showing that injuries among protective service workers (for example) are more likely to lead to disability compared to workers in other occupations could reflect its greater impact on limiting productivity for protective service workers than workers in other occupations; or a greater severity of injuries among protective service workers.

This study uses a previously untapped data base—administrative data from FECA—to examine the risk factors underlying a disability following a workplace injury (equation 2). The data contain a wealth of information on a wide variety of work-related injuries and illnesses that were incurred in broad set of occupations and across the country and were compensated under

[4] The notable exception is the National Longitudinal Surveys, which has been used to estimate the probability of incurring a work-related injury (Dembe et al. 2003) and to estimate independent probabilities of injury and risk factors for missing work (Strong and Zimmerman 2005).

a relatively consistent program rules and management practices. Their richness allows us to examine how risk factors vary among different groups—demographic, employment characteristics, and injury type—and the possibility of proxy effects of identified risk factors due to omitted variables. In addition, when augmented with data from FedScope, we can use it to provide a cursory examination of the extent to which some groups incur injuries (equation 1).

## II. Empirical Methods

The public-use version of the FECA administrative data (http://www.dol.gov/asp/evaluation/AllStudies.htm) describe 800,791 workplace injury and illness cases reported from January 1, 2005 through December 31, 2010, with information captured up to one year after the report date.[5] The FECA program on which the data are based provides insurance against incurring a work-related injury to all appropriated-fund civilian federal employees (U.S. Department of Labor [DOL] 2002). As staff members administer the FECA, they record a wealth of information in an administrative database. Each record in the database describes detailed information about the claimant at the time the injury was reported, pre-injury employment, and work outcomes during the first year after the injury was reported.[6]

The database has several features making it useful for this research. Most importantly, it contains a measure of lost productivity (lost wage earning capacity) that can be used to define a disability. A loss of wage earning capacity defined as an absence, reduction in hours, or transfer to a lower-paying job that is due to the work-related injury, as supported by medical evidence.

[5] A case includes a single incident of an injury and any records of disability and treatment related to that incident. The data file does not contain cases for which work outcomes were not relevant to returning to work following an injury (for example, a fatality) or in which the information did not meet data quality checks (Maxwell et al. 2013).

[6] Three key features about the data need to be emphasized. First, they contain information on injuries reported and not on individual claimants. Claimants with more than one reported injury are therefore included separately for each claim filed. Studies show that about one-third of claimants file a second claim within a few years, with most second claims filed for a distinct injury (Ruseckaite and Collie 2011; Gotz, Liu, and Galizzi 2000). These findings suggest that our data includes multiple claims and, as a result, our standard error calculations could ignore some correlation among outcomes of individuals with multiple cases. Second, like other studies (Table 1) the data contain only injuries reported to FECA. Studies suggest that databases on reported injuries exclude an estimated 40 percent of injured workers who do not submit a workers' compensation claim, with about 30 percent of the unreported claims losing time from work (Shannon and Lowe 2002). A bias in our estimated relationship between risk factors and work outcomes could therefore arise because those with less serious injuries are less likely to report them. Third, like other studies, the data lack a concrete measure of injury severity.

The data also contain information for a large group of workers from across the country and who are employed in a variety of occupations and incurred a wide variety of injuries within the same work environment ($\mathbf{X}_3$). Once work-related injuries are incurred, workers filing claims under FECA face the same set of incentives to return to work. The breadth of information provides a unique opportunity to examine how the risk factors associated with a disability following a work-related injury might vary across different groups (demographics, employment characteristics, and injury type) for a sample of workers that comprise a relatively large proportion of the nation's workforce.

**A. Injury Incidence**

Because FECA data alone are insufficient to compute incidence rates, we augment it with employment data from FedScope (http://www.fedscope.opm.gov/employment.asp)[7] to compute the number of reported injuries per 1,000 covered federal workers. We present these incidence rates for all federal workers and for different groups and use a chi-squared statistic to test for differences in rates across groups of workers. Individuals in groups with higher incidence rates would have either a greater probability to sustain a work-related injury or to file a claim if injured, and might not be representative of the population of covered workers.

Differences in incidence rates have two potential implications. If some groups of workers are more likely to sustain a work-related injury than others, efforts to reduce work-related injuries may benefit from targeting those groups of workers. Second, such differences provide a context—lacking in studies that use only data on injured workers—for interpreting findings on the risk factors of disability.

**B. Disability**

To identify risk factors associated with disability (equation 2), we developed two dichotomous measures of disability. We say that an injury resulted in *any disability* if the

[7] Because these data define groups differently than in the FECA data, the number of covered workers in a group may be overestimated or underestimated. The differences in classification schemes make comparisons by occupation untenable.

claimant was not working full-time at his or her regular job, or another job at the pre-injury wage, at any time during the first year after the injury was reported. An injury resulted in a *long-term disability* if the claimant was not working, or was working at a lower-paying job, one year after the injury was reported. Both measures capture productivity loss, using the pre-injury wage as a baseline measure. Accordingly, any drop in wage over the course of one year indicated a negative impact of the injury with our measure of any disability, while workers who continue to face a work absence, reduction in hours, or lower-paying job one year after the injury was reported are considered to have a long-term disability.

Identifying risk factors also requires measures of them. Although no data set contains exhaustive information on demographics, employment characteristics, work environment, injury type and severity, and medical services received, the FECA data contain rich measures of key inputs to disability risk. Demographic data ($\mathbf{X}_1$) include gender, age, and dependent status; employment characteristics ($\mathbf{X}_2$) include occupation categories and employing department, which is analogous to industry in the private sector; injury characteristics ($\mathbf{X}_4$) include the nature, area, and cause of injury, as well as whether the injury occurred in a single day (traumatic injury) or over more than one day (occupational illness);[8] and injury-appropriate services ($\mathbf{X}_5$) including compensation for lost wages and spending on injury-related medical benefits in the first year after the injury. More detailed information about all measures is provided in the appendix.

**Identifying Risk Factors**

A risk factor could be defined as a characteristic associated with above average rates of disability following injuries and a simple way to identify risk factors would be to compare each disability measure. Accordingly, we compute the mean rate of incurring any disability and long-term disability after a work-related injury separately for groups defined by demographics,

[8] This distinction has been found to predict outcomes, with occupational illnesses more likely to be severe than traumatic injuries (Maxwell et al. 2013).

employment characteristics, and injury type. For each group, we use a two-tailed *t*-test to determine whether the mean of each disability measure differs significantly ($p < 0.05$) between that group and all other injury cases.

Comparing mean disability rates across groups may reflect both direct effects and proxy effects of identified factors. By direct effect, we mean the causal effect of an individual or injury characteristic on the probability of disability, as reflected in equation (2). A proxy effect, by contrast, is the effect of another characteristic that is not measured but is correlated with the modeled characteristic. For instance, if females are found to have greater rates of disability than men, but females tend to have more severe injuries, it is uncertain whether being female inherently leads to a greater risk of disability (direct effect), or whether the higher disability rates can be attributed to injury severity (proxy effect). Although no observational data set on injuries can fully separate direct and proxy effects, adjusting for known differences across groups can help to reduce proxy effects. Accordingly, we compute the mean rate of any disability and long-term disability for each group, adjusting for differences in all other measured characteristics.

We computed adjusted means using a multivariate regression framework to estimate a streamlined version of equation (2), eliminating $\mathbf{X}_{3i}$ for reasons discussed in the previous subsection and $\mathbf{X}_{5i}$ because injury-appropriate services measures would serve as a proxy for injury severity:[9]

(3) $Y_i|_i = \alpha + \boldsymbol{\beta}_1'\mathbf{X}_{1i} + \boldsymbol{\beta}_2'\mathbf{X}_{2i} + \boldsymbol{\beta}_4'\mathbf{X}_{4i} + \varepsilon_i$

where $Y_i$ is a measure of whether an injury claim *i* results in a claimant's disability, each **X** is a vector of groupings as defined above, and $\varepsilon_i$ is an idiosyncratic error term.[10] Similar to equation

[9] Issues of causality arise. Providing appropriate services is expected to decrease the severity of disability following injury and more severe injuries are likely to lead to the provision of greater services. Given that correlations in observational data reflect both the causal effect of services and the selection effect of service provision, we do not use compensation or medical services as predictors of disability. Instead, we summarize compensation payments and medical expenses for all injuries, then again for injuries resulting in any disability or long-term disability, as an alternate measure of their severity.

[10] The estimation also includes a vector of binary variables for region of the country in which the claim was processed to control for differences in the work environment. Although this specification is estimated on a pooled cross-section,

(2), the three vectors of risk factors are demographics ($\mathbf{X}_{1i}$), employment characteristics ($\mathbf{X}_{2i}$), and injury characteristics ($\mathbf{X}_{4i}$).[11]

The adjusted mean for a group (such as injuries among healthcare workers) is computed as the predicted value of the disability outcome for an individual in that group using the mean value of all other characteristics in an ordinary least squares (OLS) estimation. We performed a *t*-test to determine whether each adjusted mean differed significantly ($p < 0.05$) from the adjusted mean of all other individuals.[12] If adjusted means of disability measures differ less across groups than unadjusted means, proxy effects may explain the differences in unadjusted means. Given that adjusted means remove these proxy effects to the extent possible with our data, we focus on the adjusted means, or equivalently the regression coefficients in equation (3), to identify risk factors associated with disability.

**Differences in Risk Factors Across Groups**

We examine whether the risk factors for disability differ across groups. Because the FECA data contain a wide variety of worker demographics, employment characteristics, and injuries, the observed differences in disability rates are essentially average differences over disparate injuries. The breadth of the data provides the opportunity to compare risk factors across groups using the same regression framework for all groups. For this analysis, we use the full sample of FECA cases and re-estimate equation (3) to produce OLS estimates of the parameters $\boldsymbol{\beta}$ that contain the same information as the adjusted means. Specifically, the coefficient on an indicator variable for a given group represents the difference in disability rates between that group and the omitted category for that characteristic, adjusting for differences in other characteristics.

controlling for a time trend through year-specific intercepts had little impact on the findings. Accordingly, we have omitted the time trend for parsimony.

[11] Here and in subsequent analyses, we create separate categories for missing values of gender, age, and occupation. Coefficients for these variables are not reported in the tables.

[12] Specifically, we estimated equation (3) using only a single dummy variable for the category being tested. For example, to compute the adjusted mean for injuries among employees in healthcare occupations, we included a dummy variable equal to 1 if the injury was reported by a healthcare worker, but no other occupational dummies. The coefficient on that dummy represents the difference in adjusted means between injuries among healthcare workers and injuries among workers in other occupations, and the *t*-statistic associated with that coefficient was used to perform the statistical test of significance.

More positive coefficients indicate a higher risk of disability, also corresponding to a greater adjusted mean of the disability measure. We repeat the estimation of equation (3), stratifying analyses by demographics, employment characteristics, and injury type. In each stratified analyses, the corresponding vector of characteristics is excluded from the estimations. For instance, when stratifying by age, $\mathbf{X}_1$ includes indicators for gender and dependents but not age. The resulting coefficients have the same interpretation but allow for the identification of risk factors stratified by each characteristic.

Comparing estimated parameters across groups in each stratification shows differences in risk factors. If we find that risk factors differ across groups, programs and policies intended to address disabilities among high-risk groups should use information relevant to the specific population of interest. More broadly, caution would be warranted in extrapolating findings from much of the literature, which examines risk factors data on very specific groups.

**III. Findings**

The FECA administrative data shed light on identifying risk factors of disability following workplace injuries and their differences across groups and to compute crude injury incidence rates. The large number of observations in the FECA means that even small differences in outcomes across groups may be statistically significant, however. To focus discussion of results on substantive differences in comparisons across groups, we follow three general principles. First, we focus discussion of groups of injuries and employment characteristics whose frequency of any disability differed from the mean (or from the omitted category in regression analyses) by at least 2 percentage points because smaller differences across these groups are unsurprising due to the differences in circumstances faced by claimants. Second, we discuss demographic differences of any magnitude due to the potential implications of even small differences across gender, age, or dependent status. Finally, we focus our discussions of long-term disability on situations in which findings are qualitatively different from the any disability measure.

Our analyses show three ways in which risk factors for incurring a disability differed across groups, defined by demographics, employment characteristics, and injury characteristics: the probability of incurring an injury, the probability of incurring a disability once an injury occurs, and the size of the association between a risk factor and the probability of incurring a disability.

**A. Injury Incidence**

Not all workers were equally likely to sustain an injury at work and report it through FECA (Table 2). In 2010, each 1,000 covered employees filed an average of 42 FECA cases, although this incidence rate differed slightly with demographic characteristics of the claimant and dramatically across employing department. Workers age 24 were more likely to report an injury than average (80 injuries per 1,000 workers), and employees in the Department of Homeland Security reported 67 injuries per 1,000 covered workers, and employees in the Department of Defense reported 28.

**B. Disability**

A minority of work-related injuries resulted in a disability, but that minority appeared to have severe injuries. Only 11 percent of work-related injuries resulted in any disability and 4 percent resulted in a long-term disability (Table 3). Only a small fraction of injuries (8 percent) involved any compensation for lost wages, although most (63 percent) received at least one medical service related to the injury. However, service delivery was highly concentrated among injuries resulting in any disability or long-term disability, likely indicating their severity. Among injuries resulting in any disability, a majority (79 percent) claimed some compensation in the first year, with benefits averaging $7,264. Medical services were more common and more expensive on average, with total compensation and medical costs reaching $19,608 for the average injury with lost time, compared to an average of only $2,862 for all cases. Similarly, most injuries resulting in long-term disability (69 percent) were awarded compensation for lost wages. Compensation benefits averaged $10,951 for these injuries, and total compensation and medical costs averaged $25,010. These findings, qualitatively consistent with other studies of

workers' compensation programs, highlight the high cost of injuries resulting in a disability. It may be worth noting that if the least severe injuries are less likely to be reported (Shannon and Lowe 2002), these statistics may understate the rarity of injuries resulting in detectable disabilities.

### Identifying Risk Factors

Groups differ substantially in their rates of incurring any disability and long-term disability after a work-related injury (Table 4). Injuries among females and workers age 55 and over were more likely to be associated with any disability (12 percent) than other injuries. Across occupational groups, injured office and administrative support workers had the greatest incidence of any disability following injury (14 percent), while protective service workers had the least (9 percent). Across employing departments, 14 percent of injuries reported by U.S. Postal Service workers resulted in any disability, while only 8 percent of injuries reported by the Defense and Veterans Affairs departments did so. Differences across injury characteristics were particularly stark: above-average proportions of injuries classified as pain (13 percent), those affecting the knee (16 percent) or shoulder (21 percent), and those caused by handling mail (16 percent) resulted in any disability. By contrast, below-average proportions of wounds (4 percent), injuries affecting the head externally (7 percent) or internally (4 percent), and injuries caused by an animal or insect bite (2 percent) resulted in any disability. A large fraction of occupational illnesses also resulted in any disability (17 percent). Patterns across groups in long-term disability were qualitatively similar, but the differences were smaller in magnitude, consistent with the lower frequency of this measure overall.

Some differences in the frequency of disability were altered upon adjustment for other differences. Most notably, the adjusted mean of any disability differed from the overall mean by no more than 2 percentage points for any occupation. Several other differences in raw means shrank upon adjusting for other differences. For instance, 8 percent of injuries sustained by workers aged 14 to 24 and having otherwise average characteristics resulted in any disability

(compared with 4 percent of injuries sustained by this group overall). Adjusted frequency of any disability for wounds (6 percent), injuries classified as pain (11 percent), injuries affecting the shoulder (20 percent) or head externally (8 percent), and injuries caused by handling mail (12 percent) were closer to the overall mean. Few disability rates moved away from the overall mean by the adjustment, and none more than 2 percentage points. In the aggregate, these patterns suggest that some of the differences across groups in rates of disability incidence are explained by other factors, although clear differences remain. Of course, we cannot ascertain whether the remaining differences represent direct effects of those groups or proxy effects of other characteristics, such as injury severity.

**Differences in Risk Factors Across Groups**

Risk factors were qualitatively similar across groups but showed important quantitative differences (Tables 5 to 8). Risk factors identified in Table 4 were associated with a higher risk of disability for most subgroups. However, a risk factor associated with a small increase in the risk of disability in one group may be associated with a much larger increase in the risk of disability in another group. Furthermore, a small number of risk factors identified on all claimants were not associated with any increased risk of disability for specific subgroups.

We note, however, that the explanatory power of all available characteristics is poor. Demographic characteristics, detailed injury information, occupation, employing department, and location explain less than 5 percent of the variation in any disability and 2 percent of the variation in long-term disability. This explanatory power varies slightly across groups, but no more than 8 percent of the variation in either disability measure is explained in any group. While this low explanatory power need not detract from the statistically significant and potentially useful relationships detected in this and other analyses, it is a reminder that many other factors affect whether work-related injuries are associated with a disability. In particular, controlling for other measures of injury severity not measured reliably in any administrative database would likely alter the observed relationships further.

**Injury type.** Risk factors were similar across injury type but were frequently associated with greater risk of disability following occupational illnesses compared to traumatic injuries (Table 5). The same demographic, employment, and injury characteristics tended to predict a greater likelihood of any disability and long-term disability for both traumatic injuries and occupational illnesses. However, each disability outcome was nearly twice as common following occupational illnesses compared to traumatic injuries, and this increased incidence of disability was also found in many subgroups. For instance, occupational illnesses sustained by females were 4 percentage points more likely than otherwise similar illnesses sustained by males to result in any disability, while traumatic injuries sustained by females were only 1 percentage point more likely to have this outcome. Occupational illnesses sustained by workers with dependents and employees of the U.S. Postal Service were similarly more likely to be associated with any disability relative to otherwise similar traumatic injuries. Differences in risk factors across injury characteristics had less clear patterns, possibly because traumatic injuries and occupational illnesses tend to have very different natures, areas, and causes.

**Demographics.** Risk factors were similar across demographic groups, but some factors predicted different likelihoods of disability across those groups. Injuries reported by U.S. Postal Service employees were more likely to result in any disability if the injured worker was female. Knee, arm, and shoulder injuries were risk factors for both genders but were associated with a greater likelihood of any disability for male workers. By contrast, occupational illness was associated with a greater likelihood of any disability for female workers. Injuries affecting the knee, arm, or shoulder were more likely to be associated with any disability if sustained by a worker age 25 or older, while injuries affecting the head internally were less likely to be associated with any disability for older workers. Occupational illnesses were also the greatest risk for workers age 25 to 54, with no difference in incidence rates of any disability for workers age 14 to 24. Patterns were similar for risk factors of long-term disability, but quantitative differences in risk factors were small for workers with and without dependents.

**Employment Characteristics.** Differences in risk factors across occupation were relatively minor compared to other stratifications. The most notable differences were in the area of injury: knee injuries were particularly likely to be associated with any disability among protective service workers, while shoulder injuries were particularly likely to be associated with any disability among installation, maintenance, and repair workers. Long-term disability incidence again showed similar patterns, although differences in risk factors across occupations were very small.

Differences in risk factors across employing department varied, particularly among demographic risk factors. Gender had no statistically significant relationship with disability among injuries in Department of Defense employees, while injuries occurring in the U.S. Postal Service were 3 percentage points more likely to result in any disability if reported by a female. Injuries reported by Department of Homeland Security workers were also more likely to result in any disability when the injured worker was age 55 or older. Associations between injury characteristics and risk factors also varied with department. For instance, shoulder injuries were more likely to result in any disability when reported by U.S. Postal Service or Department of Defense workers.

These relationships highlight several implications for the study of risk factors. While the qualitative consistency of the relationships between characteristics and disability outcomes across groups allows for broad generalizations about risk factors, caution is needed in extrapolating numerical predictions of disability incidence observed in one group. For instance, a risk factor identified in one occupation is likely to be a risk factor in other occupations, but the factor may be associated with a greater likelihood of disability in one occupation than another. Information about these numerical differences may be useful in developing policies and procedures for helping specific groups of injured workers. The numerical differences in relationships across groups are also a reminder that the risk factors may be proxies for unobserved factors. For instance, differences in the gender-disability relationship across

employing agencies cast some doubt on a hypothesis that higher severity injuries among female are due to an inherent gender difference. Instead, females may tend to face other unobserved risk factors in some industries but not others.

**IV. Conclusions**

Substantial literature has focused on the most severe work-related injuries and the administrative data from FECA claimants confirms a key driver of that focus: a small fraction of work-related injuries be associated with disabilities that are costly to the injured worker and employer. The 11 percent of reported injuries that involved any disability incurred an average of nearly $20,000 in compensation and medical benefits in the first year, compared to an average cost of under $3,000 for all work-related injuries. Those injuries that resulted in long-term disability incurred over $25,000 in benefits in the first year, on average.

We use the FECA data to augment that literature's findings on risk factors for incurring a disability after a work-related injury. These data cover a broad population of workers' compensation claims and allow us to examine demographics, employment characteristics, and injuries that were associated with a greater likelihood of incurring a disability after a work-related injury was reported. Our analyses identified three ways in which risk factors for incurring a disability differed across groups, defined by demographics, employment characteristics, and injury characteristics. First, injury incidence varied substantially across groups, which suggests that the group of federal workers reporting injuries might differ from the population of federal workers because of differences in the probability of incurring an injury. Second, the probability of incurring a disability among injured workers varied across groups. Although some of these disability differences were partially explained by differences in other characteristics, clear differences still remain across the groups we examined. Third, although the risk factors most strongly associated with disability were similar across groups, the numerical associations between these risk factors and outcomes varied across groups, suggesting that a risk factor may predict a small increase of a disability in one group but a large increase in another group.

More specifically, our results suggest that injuries reported by females, workers age 55 and over, and U.S. Postal Service employees were more likely than otherwise similar injuries to result in a disability. Certain types of injuries were also risk factors: back injuries, those affecting the shoulder or knee, and falls were all more likely than other injuries to result in disability. Occupational illnesses, which occur over more than one day, were also far more likely to result in a disability than traumatic injuries, which occur within a single day. We also show that identification of these risk factors is sensitive to controls for other characteristics. The associations between some risk factors and incidence of disability appear to include proxy effects of other factors correlated with the risk factors.

The heterogeneity in risk factors that our research uncovered has several important implications. First, it provides valuable information for practitioners to use in helping injured workers recover from the injury. If a particular type of injury (for example) is associated with a disability, programs for occupations or demographic groups with high prevalence rates of this injury type might focus efforts on injury prevention. Second, it highlights ways for researchers and practitioners to identify promising practices to aid in recovery after a work-related injury. If an organization is concerned about gender disparities in disability incidence, for example, research might focus on what we learn from the Department of Defense, for which disability incidence following injury is equally likely for females and males. Third, it provides information specific to many groups of individuals and injury types that may not be garnered from data on a narrowly defined population, which can help identify which risk factors faced by workers in a particular occupation or industry might differ from a different group of workers.

Our findings also highlight some cautions for future research. Because our injury incidence rates suggest that some groups of workers are more likely to be injured and report the injury than others, injured workers are not representative of all workers. This finding suggests that risk factors identified through observational data should not be interpreted causally: risk factors measured without adequate controls were shown to proxy for other correlated characteristics.

Even rich data on individuals and injuries has limited ability to predict disability, highlighting the many other factors, such as injury severity not captured by recorded injury characteristics, which affect injured workers. Unfortunately, we cannot offer a panacea to these problems. While correlational analysis of administrative data offers many important insights that may be valuable to preventing work-related injuries and minimizing their impacts, more research is needed to identify the most effective methods of improving programs intended to help this population.

## Table 1. Studies on Work-related Injuries and Work Outcomes

| Authors | Dependent Variable | Sample | Estimation Method | Individual or Case Characteristics | Injuries Examined | Occupation | Industry | Services | Key findings |
|---|---|---|---|---|---|---|---|---|---|
| | | | | | **Injuries** | | | | |
| Breslin et al. (2003) | Claim rates by age and gender. | Workers' compensation claim rates with lost time between 1993 and 2000 in Ontario Canada. | Incidence rates. | Age and gender. | Reported for workers compensation. | Unknown, not examined. | Goods and services. | Unknown, not examined. | Younger males had higher claim rates than adults while adult females had the highest claim rates. Age was positively associated with injury severity. |
| Breslin et al. (2007) | Yearly claim rates (by injury). | Workers' compensation claim rates between 1990 and 2003 in Ontario Canada. | Ordinary least squares regression. | Age, gender, job tenure, and occupation physical demand. | Reported for workers compensation. | Manual, mixed, nonmanual. | All, coded into 12 categories. | Unknown, not examined. | Reduced work-related compensation claims was more strongly correlated with a decrease in workers in occupations with high physical demands than with changes in workforce demographics. |
| DeJoy et al. (2004) | | 2,208 employees in a large national retail chain in 21 locations responding to a survey | Hierarchical regression. | Age, gender, tenure, and hours worked per week. | Self report. | Unknown, not examined. | Retail. | Unknown, not examined. | Three factors--environmental conditions, safety-related policies and programs, and general organizational climate-- accounted for 55 percent of the variance in perceived safety climate. |
| Dembe et al. (2005) | Whether injury occurred. | National Longitudinal Survey of Youth for 1987 to 2000 injuries. | Cox proportional hazard regression. | Age , gender, race, ethnicity, urban, covered by union, dislikes job, and wages. | Self reported in survey. | Census categories. | Census categories. | Unknown, not examined. | Increased injury hazard rates were associated with jobs with overtime schedules, at least 12 hours per day, and at least 60 hours per week. |
| Loomis and Richardson (1998) | Fatality rates. | Medical examiner and census data in North Carolina. | Fatality rates. | Black-white, gender, age. | Fatalities. | Census categories. | Census categories. | Unknown, not examined. | Blacks occupational fatality 1.3 to 1.5 times higher than whites, with the difference partially explained by occupational employment structure. |
| Verma et al. (2007) | Whether fall resulted in a fracture. | Workers' compensation claims in 2000 to 2002 (females) from a large insurer operating in all states, except North Dakota, and Washington D.C. | Log-binomial regression. | Claim date of injury, age, sex, date of report, accident description, injury description, injury cause, occupation, job description, tenure, and industry. | Same level falls (to different body parts). | Occupations linked to O*NET to assess physical activities. | Unknown, not examined | Unknown, not examined. | Risk of fracture increased with age. Lowest risk observed in occupations was those with moderate physical activity levels. |
| | | | | | **Work Outcomes** | | | | |
| Blackwell et al (2003) | Return to work. | 502 injured workers in Montana referred to vocational rehabilitation services between 1984 and 1991. | Logistic regression in a pre-post model of behavior after legislation. | Age, education, attorney involvement, and time from injury to referral. | Back, upper body, lower body. | Unknown, not examined. | Unknown, not examined. | Mandated vocational rehabilitation. | Education was a strong predictor of work outcomes with age, attorney involvement, mandated vocational rehabilitation, and timely provision of services also significant. |
| Boden and Galizzi (2003) | Earnings for workers who received workers' compensation for at least eight days. | Matched records from Wisconsin workers' and unemployment compensation wage, and employment security data. | Generalized least squares, difference in difference, and Blinder-Oaxaca decompositions. | Age, years at work, employer characteristics, claim characteristics, and earnings. | Head/neck/ back, back only, upper extremities, carpal tunnel, trunk/multiple/ different injuries. | All, coded into six categories. | All coded into eight categories. | Unknown, not examined. | Women lost a greater percent of earnings 3.5 years after injury but differences in injury-related nonemployment account for about half the gap and changes in hours worked may explain rest.. |

| Authors | Dependent Variable | Sample | Estimation Method | Individual or Case Characteristics | Injuries Examined | Occupation | Industry | Services | Key findings |
|---|---|---|---|---|---|---|---|---|---|
| Cheadle et al (1994) | Length of time payment was made for lost wages. | 28,473 randomly selected workers compensation claims in the state of Washington from injuries occurring 1987 to 1989. | Multivariate survival analysis (Cox proportional hazards). | Gender, age, marital status, dependents, county, year of injury, unemployment, firm size, and private/government, | Fracture, Sprain (back/neck), sprain other, carpal tunnel, and other. | Unknown, not examined. | All, coded into 11 categories. | Hospitalized within 28 days, workers' compensation program status, and benefit rate. | Older, female, carpal tunnel or back/neck sprain longer duration of disability (adjusting for severity). Lower magnitude predictors: divorced, small firm, higher unemployment, construction and agriculture. |
| Johnson and Ondrich (1990) | Number of months absent from work associated with injury. | 1,040 permanently partially disabled workers (excluded illnesses and lower back pain) injured in 1970 in Florida, New York, and Wisconsin | Weibull hazard without random effects, with gamma-distributed random effect, and with a nonparametric random effect. | Age, benefit, education, experience, severity of impairment, race, married, male, union, and log wage. | Amputation, bruises/contusions/poisons, burns, hearing loss, sprains/dislocations/ fractures, and vision. | Unknown, not examined. | Construction and trans-portation binaries in estimation. | Unknown, not examined. | Type of physical impairment is more important on return to work than severity of impairment. |
| MacKenzie et al (1998) | Time (in days) from injury to the first time returned to work. | 312 patients from three level-I trauma centers in Seattle Washington, Baltimore Maryland, and Nashville Tennessee. | Cox regression. | Age, gender, education, poverty, marital status, social support, alcohol problem, physical demands, job tenure, benefits, flexibility, job satisfaction, work motivation, pre-injury compensation, and lawyer. | Blunt, unilateral lower extremity fracture, excluding patellar fractures and minor (metatarsal and phalangeal) foot fractures. | All occupations with six categories used in estimations. | Unknown, not examined. | Unknown, not examined. | Although impairment is a significant determinant of returning to work, many nonmedical factors influence the translation of an impairment into poor vocational outcome. |
| MacKenzie et al (1987) | Work full time at 12 months after injury. | 266 trauma patients in two Maryland shock trauma units who worked full time before injury. | Regression. | Age, race, sex, marital status, education, income, head household, type prior work, social supports. | Trauma patients head/neck, spine, extremities, abdomen/thorax | Blue collar, white collar as binaries in estimation. | Unknown, not examined. | Unknown, not examined. | Confidants, income, education are key determinants of returning to work. |
| Seabury and McLaren (2010) | Earnings and employment after injury | Bureau of Labor Statistics injury and illness data and medical expenditure surveys for California | Multivariate regression. | Age, earnings, and occupation. | Musculoskeletal, with others compared to it. | Firefighters, police, corrections, teachers, construction, and laborers. | Spans industries but focus is protective service. | Chiropractic care and physical or occupational therapy. | Increase in the frequency of musculoskeletal disorders for older firefighters is consistent with exposure to cumulative trauma. |
| **Both Injuries and Work Outcomes** | | | | | | | | | |
| Liao et al (2001) | Injury frequency and duration out of work. | 171 firefighters in a Major Midwestern city. | Negative binomial regression and Weibull survival model estimations. | Gender, marital status, race, psychological tests, and weekly wage. | Back sprain, other strains/ sprains, burns/ chemical exposure, fracture/ laceration, contusion, contagious disease exposure . | Firefighters (for example, captain, chief, trainee). | Protective services. | Indicator for whether the injury claim was approved. | Females are more prone to injury and age, tenure, gender, marital status, type of injury, wage, and psychology indices predict duration out of work. |
| Strong and Zimmerman (2005) | Self-reported injury status and the number of workdays missed. | National Longitudinal Survey of Youth aged 14 to 24 in 1978. | Logistic and negative binomial regression models using generalized. | Race/ethnicity, age, marital status, education, gender, region, job and workforce tenure, collective bargaining agreement, work shift, wage, full-time status, second job, and paid hourly or salary. | None. | Three-digit census codes, with laborer the omitted category. | Three-digit census codes. | Unknown, not examined. | Blue-collar, fulltime, tenure, multiple jobs, and late shift associated with increased odds of occupational injury or illness. Racial/ethnic minority workers missed more work days than whites, but were not more likely to report injury or illness. |

**Table 2. Incidence of Workplace Injury Among Federal Employees in 2010**

| | Number of Employees | Number of Injuries | Incidence Rate |
|---|---|---|---|
| United States | 1,926,279 | 79,952 | 41.5 |
| **Demographic Characteristics** | | | |
| Gender | | | |
| Female | 826,513 | 33,795 | 40.9 |
| Male | 1,099,765 | 46,157 | 42.0 |
| Age | | | |
| 14-24 | 69,897 | 5,583 | 79.9 |
| 25-54 | 1,332,938 | 54,037 | 40.5 |
| 55 or more | 473,995 | 19,033 | 40.2 |
| **Employment Characteristics** | | | |
| Department | | | |
| Defense | 764,299 | 21,640 | 28.3 |
| Homeland Security | 188,983 | 12,617 | 66.8 |
| Veterans Affairs | 308,814 | 14,160 | 45.9 |
| Other departments | 664,183 | 31,535 | 47.5 |

Source: FECA Administrative Data, available at http://www.dol.gov/asp/evaluation/AllStudies.htm, and FedScope data, available at http://www.fedscope.opm.gov/employment.asp.

Notes: Number of employees is measured in September 2010, and incidence rate is the ratio of injuries per 1,000 employees. The Postal Service is excluded from this table only due to limitations of employment data. The number of employees in each geographic region is obtained by adding employee counts by state, but regions may not match those of injury data, which do not follow state lines exclusively. FECA cases with missing gender (one case) or age (1,299 cases) are excluded from the respective tabulations, and location tabulations exclude employees outside of the United States.

**Table 3. Compensation and Medical Payments by Disability**

| | All Cases | Any Disability | Long-term Disability |
|---|---|---|---|
| Average benefit payment per case | $2,862<br>(12,238) | $19,608<br>(32,047) | $25,010<br>(46,551) |
| **Compensation** | | | |
| Percentage cases receiving compensation | 8.3 | 78.7 | 68.6 |
| Average payments for compensation | $767<br>(3,928) | $7,264<br>(9,943) | $10,951<br>(13,032) |
| Average payments for compensation, if any | $9,235<br>(10,368) | $9,235<br>(10,369) | $15,953<br>(12,947) |
| **Medical Payments** | | | |
| Percentage cases receiving payment for medical payments | 62.6 | 98.0 | 97.8 |
| Average payments for medical payments | $2,095<br>(10,340) | $12,343<br>(28589) | $14,059<br>(42544) |
| Average payments for medical payments, if any | $3,348<br>(12,910) | $12,596<br>(28,825) | $14,371<br>(42,961) |
| **Distribution of Cases** | | | |
| Number of Cases | 800,791 | 84,575 | 33,085 |
| Percent distribution | 100.0 | 10.6 | 4.1 |

Source: FECA Administrative Data, available at http://www.dol.gov/asp/evaluation/AllStudies.htm.

Note: Standard deviations are in parenthesis.

**Table 4. Characteristics of Cases with Disability**

| | Distribution | | Any Disability | | Long-term Disability | |
|---|---|---|---|---|---|---|
| | Number | Percentage | Mean | Adjusted Mean | Mean | Adjusted Mean |
| All | 800,791 | 100.0 | 10.6 | 10.6 | 4.1 | 4.1 |
| **Demographic Characteristics** | | | | | | |
| Gender | | | | | | |
| Male | 452,770 | 56.5 | 9.5* | 9.9* | 3.6* | 3.7* |
| Female | 347,936 | 43.4 | 11.9* | 11.5* | 4.9* | 4.7* |
| Age in Years | | | | | | |
| 14 - 24 | 39,009 | 4.9 | 4.2* | 7.5* | 1.9* | 3.1* |
| 25 - 54 | 576,288 | 72.0 | 10.6* | 10.5 | 4.1 | 4.1* |
| 55 + | 177,702 | 22.2 | 11.7* | 11.3* | 4.5* | 4.5* |
| Has Dependents | | | | | | |
| No | 349,321 | 43.6 | 10.0* | 9.9* | 4.2 | 3.9* |
| Yes | 451,470 | 56.4 | 11.0* | 11.1* | 4.1 | 4.3* |
| **Employment Characteristics** | | | | | | |
| Occupation | | | | | | |
| Office and administrative support | 243,554 | 30.4 | 13.5* | 10.6* | 5.3* | 4.2* |
| Protective service | 60,244 | 7.5 | 8.5* | 10.5* | 3.0* | 3.6* |
| Healthcare | 52,272 | 6.5 | 10.1* | 12.1* | 5.1* | 5.7* |
| Installation, maintenance and repair | 41,443 | 5.2 | 8.9* | 11.7* | 3.1* | 4.3* |
| Business and financial | 33,097 | 4.1 | 10.1* | 10.5 | 3.7* | 3.5* |
| Other occupations | 140,968 | 17.6 | 8.6* | 11.1* | 3.3* | 4.2 |
| Department | | | | | | |
| U.S. Postal Service | 327,051 | 40.8 | 13.9* | 13.7* | 5.3* | 5.2* |
| Defense | 133,347 | 16.7 | 8.3* | 8.8* | 3.0* | 3.3* |
| Homeland Security | 93,146 | 11.6 | 9.8* | 9.4* | 4.0 | 4.0* |
| Veterans Affairs | 78,781 | 9.8 | 8.0* | 6.2* | 3.3* | 2.1* |
| Other departments | 168,466 | 21.0 | 7.5* | 8.5* | 3.2* | 3.7* |
| **Injury Characteristics** | | | | | | |
| Nature of Injury | | | | | | |
| Sprain | 162,819 | 20.3 | 12.2* | 10.5* | 4.0* | 3.9* |
| Wound | 149,826 | 18.7 | 4.2* | 6.2* | 1.8* | 2.6* |
| Back | 101,440 | 12.7 | 10.6 | 11.5* | 5.4* | 5.2* |
| Pain | 61,125 | 7.6 | 13.4* | 10.9* | 5.0* | 4.2 |
| Other natures | 325,581 | 40.7 | 12.1* | 12.2* | 4.7* | 4.6* |
| Area of Injury | | | | | | |
| External (trunk area) | 143,022 | 17.9 | 10.5 | 9.6* | 5.2* | 4.4* |
| Knee | 81,298 | 10.2 | 16.3* | 16.7* | 5.0* | 5.3* |
| Arm | 69,726 | 8.7 | 11.9* | 11.5* | 4.1 | 4.0 |
| Shoulder | 59,127 | 7.4 | 21.2* | 19.6* | 7.1* | 6.7* |
| Head, external | 57,835 | 7.2 | 6.6* | 7.9* | 3.3* | 3.8* |
| Leg | 56,738 | 7.1 | 9.0* | 10.4* | 3.4* | 4.1* |
| Head, internal | 49,446 | 6.2 | 3.9* | 2.4* | 2.2* | 1.8* |
| Hand | 43,539 | 5.4 | 10.3 | 10.3 | 3.7* | 3.7* |
| Other areas | 240,060 | 30.0 | 8.4* | 9.0* | 3.3* | 3.6* |
| Cause of Injury | | | | | | |
| Fall | 140,188 | 17.5 | 12.1* | 12.7* | 4.5* | 4.8* |
| Handling equipment | 76,511 | 9.6 | 12.3* | 11.0* | 4.5* | 4.1 |
| Handling mail | 81,016 | 10.1 | 15.6* | 12.2* | 6.3* | 4.7* |
| Slip | 58,568 | 7.3 | 12.3* | 11.4* | 4.1 | 4.1 |
| Animal or insect | 46,448 | 5.8 | 2.0* | 3.8* | 1.0* | 1.7* |
| Other causes | 398,060 | 49.7 | 9.4* | 10.1* | 3.9* | 4.1* |
| Injury Type | | | | | | |
| Traumatic Injury | 693,491 | 86.6 | 9.6* | 9.7* | 3.8* | 3.8* |
| Occupational Illness | 107,300 | 13.4 | 17.1* | 15.8* | 6.5* | 6.1* |
| **Number of Cases** | 800,791 | | n.a. | | n.a. | |

Source: FECA Administrative Data, available at http://www.dol.gov/asp/evaluation/AllStudies.htm.

Note: The number and percentage of cases (out of 800,791) in each category is shown in the first and second columns. The remaining columns show the means and adjusted means (in percentages) of the disability probability within each group. The adjusted mean is the group's average level of disability after a regression adjustment to the mean of all other independent variables, as well as location dummies.

* indicates that the mean or adjusted mean for that group differs statistically from that of all other cases ($p<0.05$).

**Table 5. Characteristics and Disability in Aggregate and by Injury Type: Multivariate Analysis**

| | Any Disability | | | Long-term Disability | | |
|---|---|---|---|---|---|---|
| | All Cases | Traumatic Injury | Occupational Illness | All Cases | Traumatic Injury | Occupational Illness |
| **Demographic Characteristics** | | | | | | |
| Female | 0.018* | 0.011* | 0.040* | 0.011* | 0.009* | 0.019* |
| Age (25 - 54) | | | | | | |
| 14 – 24 | -0.034* | -0.030* | -0.058* | -0.011* | -0.010* | -0.024* |
| 55 + | 0.010* | 0.012* | -0.002 | 0.005* | 0.005* | 0.002 |
| Has Dependents | 0.013* | 0.010* | 0.023* | 0.005* | 0.004* | 0.007* |
| **Employment Characteristics** | | | | | | |
| Occupation (Office and administrative support) | | | | | | |
| Protective service | -0.006* | -0.003 | -0.021* | -0.008* | -0.007* | -0.005 |
| Healthcare | 0.013* | 0.018* | -0.013* | 0.014* | 0.016* | 0.003 |
| Installation, maintenance, and repair | 0.008* | 0.012* | 0.004 | 0.000 | 0.002 | -0.002 |
| Business and financial | -0.000 | 0.000 | 0.007 | -0.007* | -0.008* | 0.003 |
| Other occupations | 0.002 | 0.004* | -0.002 | -0.001 | -0.000 | 0.001 |
| Department (U.S. Postal Service) | | | | | | |
| Defense | -0.050* | -0.040* | -0.090* | -0.019* | -0.014* | -0.040* |
| Homeland Security | -0.046* | -0.032* | -0.111* | -0.014* | -0.007* | -0.048* |
| Veterans Affairs | -0.075* | -0.058* | -0.165* | -0.031* | -0.024* | -0.068* |
| Other departments | -0.056* | -0.044* | -0.104* | -0.017* | -0.011* | -0.040* |
| **Injury Characteristics** | | | | | | |
| Nature of Injury (Sprain) | | | | | | |
| Wound | -0.042* | -0.044* | -0.166* | -0.012* | -0.013* | -0.032 |
| Back | 0.017* | 0.005* | -0.075* | 0.016* | 0.011* | 0.004 |
| Pain | 0.014* | 0.000 | -0.089* | 0.007* | 0.002 | -0.016 |
| Other natures | 0.032* | 0.013* | -0.075* | 0.013* | 0.006* | -0.011 |
| Area of Injury (External, trunk area) | | | | | | |
| Knee | 0.075* | 0.067* | 0.054* | 0.010* | 0.006* | 0.016* |
| Arm | 0.027* | 0.008* | 0.060* | -0.001 | -0.005* | 0.002 |
| Shoulder | 0.106* | 0.094* | 0.107* | 0.025* | 0.020* | 0.026* |
| Head, external | -0.017* | -0.021* | -0.003 | -0.006* | -0.007* | 0.004 |
| Leg | 0.013* | 0.003 | 0.031* | -0.002 | -0.005* | 0.015* |
| Head, internal | -0.060* | -0.050* | -0.072* | -0.022* | -0.016* | -0.033* |
| Hand | 0.017* | -0.026* | 0.102* | -0.004* | -0.015* | 0.014* |
| Other areas | -0.003 | -0.010* | 0.010* | -0.007* | -0.009* | -0.004 |
| Cause of Injury (Fall) | | | | | | |
| Handling mail | 0.007* | -0.010* | 0.072* | 0.003* | -0.001 | 0.009 |
| Handling equipment | -0.005* | -0.023* | 0.073* | -0.004* | -0.009* | 0.013 |
| Slip | -0.009* | -0.013* | 0.049* | -0.006* | -0.006* | -0.001 |
| Animal or insect | -0.088* | -0.081* | -0.013 | -0.031* | -0.029* | -0.008 |
| Other causes | -0.016* | -0.026* | 0.050* | -0.004* | -0.008* | 0.014 |
| Mean Dependent Variable | 0.106 | 0.096 | 0.171 | 0.041 | 0.038 | 0.065 |
| $R^2$ | 0.045 | 0.039 | 0.079 | 0.016 | 0.015 | 0.027 |
| **Number of Cases** | 800,791 | 693,491 | 107,300 | 800,791 | 693,491 | 107,300 |

Source: FECA Administrative Data, available at http://www.dol.gov/asp/evaluation/AllStudies.htm.

Note: Numbers are coefficients from ordinary least squares estimations of equation (1) except where noted. * indicates a significant ($p \leq .05$) coefficient. Omitted categories are in parenthesis after each category name. Location variables were also included in the estimations as controls, but coefficients are not reported here. Full results are available from the authors.

## Table 6. Characteristics and Disability by Demographic Characteristics: Multivariate Analysis

| | Any Disability | | | | | | | Long-term Disability | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Male | Female | 14-24 | 25-54 | 55+ | No dependents | Dependents | Male | Female | 14-24 | 25-54 | 55+ | No dependents | Dependents |
| **Demographics** | | | | | | | | | | | | | | |
| Female | | | -0.003 | 0.018* | 0.014* | 0.014* | 0.019* | | | -0.000 | 0.012* | 0.009* | 0.010* | 0.011* |
| Age | | | | | | | | | | | | | | |
| 14-24 | -0.027* | -0.039* | | | | -0.026* | -0.043* | -0.008* | -0.015* | | | | -0.008* | -0.013* |
| 55+ | 0.010* | 0.008* | | | | 0.007* | 0.008* | 0.005* | 0.004* | | | | 0.004* | 0.004* |
| Dependents | 0.010* | 0.014* | -0.001 | 0.013* | 0.014* | | | 0.003* | 0.005* | 0.001 | 0.005* | 0.004* | | |
| **Employment Characteristics** | | | | | | | | | | | | | | |
| Occupation | | | | | | | | | | | | | | |
| Protective service | -0.006* | 0.006 | -0.009 | 0.002 | -0.005 | -0.010* | 0.006* | -0.009* | -0.002 | -0.011* | -0.005* | -0.003 | -0.010* | -0.004* |
| Healthcare | 0.021* | 0.016* | 0.016* | 0.017* | 0.011* | 0.009* | 0.020* | 0.023* | 0.014* | 0.028* | 0.016* | 0.009* | 0.010* | 0.018* |
| Installation, maintenance and repair | 0.006* | 0.021* | -0.008 | 0.014* | 0.012* | 0.010* | 0.015* | -0.003* | 0.009* | -0.003 | 0.004* | -0.003 | 0.001 | 0.002 |
| Business and financial | -0.001 | 0.003 | -0.031* | 0.001 | 0.000 | -0.011* | 0.008* | -0.009* | -0.003 | -0.016* | -0.006* | -0.006* | -0.012* | -0.003 |
| Other occupations | 0.004* | -0.000 | -0.020* | 0.007* | 0.006* | -0.004* | 0.011* | -0.002 | -0.000 | -0.008* | 0.001 | 0.002 | -0.004* | 0.003* |
| Department | | | | | | | | | | | | | | |
| Defense | -0.035* | -0.070* | -0.028* | -0.050* | -0.049* | -0.050* | -0.050* | -0.011* | -0.030* | -0.011* | -0.019* | -0.020* | -0.019* | -0.019* |
| Homeland security | -0.033* | -0.054* | 0.006 | -0.047* | -0.028* | -0.037* | -0.047* | -0.008* | -0.019* | -0.001 | -0.014* | -0.005 | -0.012* | -0.014* |
| Veterans | -0.057* | -0.090* | -0.028* | -0.078* | -0.075* | -0.074* | -0.077* | -0.019* | -0.040* | -0.015* | -0.032* | -0.032* | -0.031* | -0.032* |
| Other | -0.039* | -0.068* | -0.007 | -0.055* | -0.052* | -0.054* | -0.051* | -0.008* | -0.025* | -0.001 | -0.017* | -0.015* | -0.017* | -0.015* |
| **Injury Characteristics** | | | | | | | | | | | | | | |
| Nature | | | | | | | | | | | | | | |
| Wound | -0.044* | -0.038* | -0.011* | -0.043* | -0.054* | -0.041* | -0.045* | -0.012* | -0.014* | -0.004 | -0.013* | -0.015* | -0.013* | -0.013* |
| Back | 0.003 | 0.020* | 0.028* | 0.013* | -0.005 | 0.013* | 0.009* | 0.013* | 0.014* | 0.014* | 0.014* | 0.012* | 0.015* | 0.013* |
| Pain | 0.005* | 0.006* | 0.001 | 0.004* | -0.003 | 0.009* | -0.001 | 0.004* | 0.002 | 0.002 | 0.002 | 0.004 | 0.007* | -0.001 |
| Other | 0.015* | 0.021* | 0.009* | 0.014* | 0.023* | 0.016* | 0.018* | 0.007* | 0.008* | 0.003 | 0.006* | 0.009* | 0.007* | 0.007* |
| Area | | | | | | | | | | | | | | |
| Knee | 0.082* | 0.054* | 0.047* | 0.074* | 0.066* | 0.059* | 0.080* | 0.010* | 0.007* | 0.012* | 0.008* | 0.011* | 0.009* | 0.008* |
| Arm | 0.007* | 0.029* | -0.000 | 0.016* | 0.030* | 0.015* | 0.022* | -0.006* | -0.002 | -0.003 | -0.006* | -0.000 | -0.005* | -0.003 |
| Shoulder | 0.106* | 0.090* | 0.031* | 0.091* | 0.130* | 0.087* | 0.109* | 0.021* | 0.024* | 0.010* | 0.019* | 0.033* | 0.024* | 0.022* |
| Head, external | -0.025* | -0.008* | -0.007 | -0.016* | -0.024* | -0.018* | -0.016* | -0.008* | -0.005* | -0.005 | -0.006* | -0.008* | -0.007* | -0.006* |
| Leg | 0.001 | 0.018* | 0.010 | 0.004 | 0.022* | 0.008* | 0.008* | -0.004* | -0.002 | 0.002 | -0.005* | -0.001 | -0.004* | -0.003 |
| Head, internal | -0.072* | -0.069* | -0.007 | -0.065* | -0.096* | -0.062* | -0.079* | -0.025* | -0.028* | -0.001 | -0.022* | -0.037* | -0.024* | -0.028* |
| Hand | -0.006* | 0.017* | -0.001 | 0.005* | 0.013* | 0.005 | 0.009* | -0.010* | -0.007* | -0.001 | -0.009* | -0.005 | -0.008* | -0.008* |
| Other | -0.010* | -0.002 | 0.003 | -0.007* | -0.007* | -0.010* | -0.003 | -0.008* | -0.008* | -0.002 | -0.009* | -0.008* | -0.009* | -0.007* |
| Cause | | | | | | | | | | | | | | |
| Handle mail | -0.011* | -0.003 | -0.019* | -0.001 | -0.012* | -0.006* | -0.003 | -0.006* | -0.000 | -0.007 | -0.000 | -0.004* | 0.000 | -0.002 |
| Handle equipment | -0.020* | -0.019* | -0.020* | -0.014* | -0.020* | -0.021* | -0.013* | -0.010* | -0.008* | -0.008* | -0.008* | -0.007* | -0.008* | -0.007* |
| Slip | -0.019* | -0.010* | -0.024* | -0.010* | -0.011* | -0.015* | -0.011* | -0.008* | -0.007* | -0.011* | -0.006* | -0.008* | -0.008* | -0.006* |
| Animal | -0.084* | -0.099* | -0.056* | -0.085* | -0.100* | -0.090* | -0.086* | -0.029* | -0.036* | -0.023* | -0.030* | -0.035* | -0.033* | -0.030* |
| Other | -0.030* | -0.028* | -0.023* | -0.024* | -0.030* | -0.027* | -0.025* | -0.010* | -0.008* | -0.008* | -0.007* | -0.008* | -0.008* | -0.007* |
| Occupational Illness | 0.042* | 0.078* | 0.001 | 0.072* | 0.043* | 0.050* | 0.068* | 0.017* | 0.028* | -0.002 | 0.027* | 0.019* | 0.020* | 0.025* |
| Mean Dependent Variable | 0.095 | 0.119 | 0.042 | 0.106 | 0.117 | 0.100 | 0.110 | 0.036 | 0.049 | 0.019 | 0.041 | 0.045 | 0.042 | 0.041 |
| $R^2$ | 0.048 | 0.050 | 0.025 | 0.047 | 0.054 | 0.049 | 0.049 | 0.014 | 0.020 | 0.014 | 0.018 | 0.018 | 0.022 | 0.014 |
| **Number of Case** | 452,855 | 347,936 | 39,009 | 576,288 | 177,702 | 349,321 | 451,470 | 452,855 | 347,936 | 39,009 | 576,288 | 177,702 | 349,321 | 451,470 |

Source: FECA Administrative Data, available at http://www.dol.gov/asp/evaluation/AllStudies.htm.

Note: Numbers are coefficients from ordinary least squares estimations of equation (1) except where noted. * indicates a significant ($p \leq .05$) coefficient. See Table 5 for omitted categories. Location variables were also included in the estimations as controls, but coefficients are not reported here. Full results are available from the authors.

### Table 7. Characteristics and Disability by Employment Characteristics (Occupation): Multivariate Analysis

| | Any Disability | | | | | | Long-term Disability | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Office and Administrative Support | Protective Service | Healthcare | Installation, Maintenance, and Repair | Business and Financial | Other | Office and Administrative Support | Protective Service | Healthcare | Installation, Maintenance, and Repair | Business and Financial | Other |
| **Demographic Characteristics** | | | | | | | | | | | | |
| Female | 0.029* | 0.018* | 0.013* | 0.012* | 0.013* | -0.001 | 0.018* | 0.012* | 0.006* | 0.008* | 0.008* | 0.002 |
| Age | | | | | | | | | | | | |
| 14 – 24 | -0.044* | -0.016* | -0.038* | -0.033* | -0.048* | -0.027* | -0.018* | -0.011* | -0.019* | -0.011* | -0.019* | -0.008* |
| 55 + | 0.007* | 0.016* | 0.008* | 0.009* | 0.014* | 0.006* | 0.005* | 0.010* | 0.004 | -0.000 | 0.004 | 0.004* |
| Has Dependents | 0.013* | 0.009* | 0.011* | 0.004 | 0.015* | 0.014* | 0.005* | 0.002 | 0.007* | 0.000 | 0.004 | 0.005* |
| **Employment Characteristics** | | | | | | | | | | | | |
| Department | | | | | | | | | | | | |
| Defense | -0.056* | -0.050 | -0.104* | -0.025* | -0.081* | -0.043* | -0.026* | 0.023 | -0.055* | 0.000 | -0.057* | -0.022* |
| Homeland Security | -0.047* | -0.063 | -0.046 | -0.012 | -0.053 | -0.037* | -0.017* | 0.014 | -0.003 | 0.002 | -0.051* | -0.019* |
| Veterans Affairs | -0.095* | -0.062 | -0.119* | -0.045* | -0.104* | -0.062* | -0.038* | 0.009 | -0.063* | -0.004 | -0.064* | -0.025* |
| Other departments | -0.061* | -0.047 | -0.109* | -0.018* | -0.048 | -0.062* | -0.026* | 0.023 | -0.063* | 0.006 | -0.041* | -0.023* |
| Injury Characteristics | | | | | | | | | | | | |
| Nature of Injury | | | | | | | | | | | | |
| Wound | -0.047* | -0.043* | -0.055* | -0.047* | -0.047* | -0.052* | -0.014* | -0.008* | -0.022* | -0.011* | -0.015* | -0.015* |
| Back | 0.006 | 0.014* | 0.013* | -0.007 | 0.017* | 0.003 | 0.014* | 0.010* | 0.014* | 0.012* | 0.020* | 0.013* |
| Pain | 0.012* | -0.009* | -0.005 | -0.008 | -0.011 | -0.010* | 0.007* | -0.001 | -0.002 | -0.006 | -0.005 | -0.002 |
| Other natures | 0.022* | 0.007* | 0.002 | 0.019* | 0.014* | 0.004 | 0.010* | 0.005* | -0.000 | 0.009* | 0.003 | 0.003* |
| Area of Injury | | | | | | | | | | | | |
| Knee | 0.062* | 0.108* | 0.052* | 0.086* | 0.062* | 0.076* | 0.007* | 0.008* | 0.002 | 0.006 | 0.016* | 0.012* |
| Arm | 0.023* | 0.013* | 0.009 | -0.006 | 0.009 | 0.020* | -0.007* | -0.009* | -0.005 | -0.004 | 0.001 | -0.000 |
| Shoulder | 0.103* | 0.095* | 0.057* | 0.122* | 0.087* | 0.102* | 0.025* | 0.011* | 0.013* | 0.025* | 0.022* | 0.019* |
| Head, external | -0.014* | -0.018* | -0.004 | -0.049* | -0.024* | -0.024* | -0.006* | -0.012* | 0.000 | -0.016* | -0.002 | -0.008* |
| Leg | 0.005 | 0.017* | 0.002 | -0.006 | 0.011 | 0.001 | -0.008* | -0.010* | -0.004 | -0.010 | 0.006 | -0.003 |
| Head, internal | -0.087* | -0.037* | -0.050* | -0.099* | -0.073* | -0.056* | -0.034* | -0.018* | -0.021* | -0.034* | -0.016* | -0.017* |
| Hand | 0.007 | -0.011 | -0.010 | -0.018* | 0.000 | 0.002 | -0.011* | -0.014* | -0.015* | -0.011* | 0.004 | -0.005 |
| Other areas | -0.006* | 0.003 | -0.009 | -0.021* | -0.003 | -0.003 | -0.012* | -0.008* | -0.010* | -0.009* | 0.004 | -0.005* |
| Cause of Injury | | | | | | | | | | | | |
| Handling mail | -0.012* | -0.005 | -0.022* | -0.027* | -0.019* | -0.013* | -0.003 | -0.006 | -0.018* | -0.018* | -0.016* | -0.007* |
| Handling equipment | -0.025* | -0.019* | -0.017* | -0.036* | 0.004 | -0.016* | -0.010* | -0.008* | -0.007 | -0.018* | 0.003 | -0.010* |
| Slip | -0.017* | -0.008 | 0.011 | -0.034* | 0.001 | -0.014* | -0.004* | -0.006 | 0.002 | -0.016* | -0.008 | -0.010* |
| Animal or insect | -0.093* | -0.059* | -0.065* | -0.122* | -0.091* | -0.080* | -0.029* | -0.017* | -0.018 | -0.038* | -0.035* | -0.029* |
| Other causes | -0.034* | -0.026* | -0.020* | -0.042* | -0.022* | -0.025* | -0.007* | -0.011* | -0.005 | -0.015* | -0.012* | -0.009* |
| Occupational illness | 0.094* | -0.011 | -0.009 | 0.027* | 0.041* | 0.020* | 0.036* | 0.001 | -0.006 | 0.006 | 0.018* | 0.006* |
| Mean Dependent Variable | 0.135 | 0.085 | 0.101 | 0.089 | 0.101 | 0.086 | 0.053 | 0.030 | 0.051 | 0.031 | 0.037 | 0.033 |
| $R^2$ | 0.031 | 0.028 | 0.053 | 0.058 | 0.039 | 0.038 | 0.013 | 0.021 | 0.013 | 0.026 | 0.009 | 0.010 |
| Number of Cases | 243,554 | 60,244 | 52,272 | 41,443 | 33,097 | 140,968 | 243,554 | 60,244 | 52,272 | 41,443 | 33,097 | 140,968 |

Source: FECA Administrative Data, available at http://www.dol.gov/asp/evaluation/AllStudies.htm.

Note: Numbers are coefficients from ordinary least squares estimations of equation (1) except where noted. * indicates a significant ($p \le .05$) coefficient. See Table 5 for omitted categories. Location variables were also included in the estimations as controls, but coefficients are not reported here. Full results are available from the authors.

## Table 8. Characteristics and Disability by Employment Characteristics (Department): Multivariate Analysis

| | Any Disability | | | | | Long-term Disability | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | U.S. Postal Service | Defense | Homeland Security | Veterans Affairs | Other | U.S. Postal Service | Defense | Homeland Security | Veterans Affairs | Other |
| **Demographic Characteristics** | | | | | | | | | | |
| Female | 0.032* | -0.001 | 0.012* | 0.006* | 0.002 | 0.020* | 0.002 | 0.007* | 0.002 | 0.003* |
| Age | | | | | | | | | | |
| 14 – 24 | -0.054* | -0.037* | -0.031* | -0.039* | -0.019* | -0.019* | -0.011* | -0.015* | -0.014* | -0.007* |
| 55 + | 0.009* | 0.006* | 0.022* | 0.003 | 0.010* | 0.005* | 0.003* | 0.011* | 0.000 | 0.005* |
| Has Dependents | 0.016* | 0.009* | 0.007* | 0.012* | 0.015* | 0.006* | 0.003* | 0.004* | 0.003* | 0.006* |
| **Occupation** | | | | | | | | | | |
| Protective service | -0.016 | -0.003 | -0.016* | 0.006 | 0.004 | -0.046 | 0.003 | -0.014* | -0.009 | 0.001 |
| Healthcare | 0.035 | -0.002 | 0.045* | 0.006 | -0.001 | 0.025 | 0.003 | 0.044* | 0.002 | -0.002 |
| Installation, maintenance, and repair | -0.003 | 0.005 | 0.010 | 0.013* | 0.016* | -0.015* | 0.001 | -0.006 | 0.001 | 0.007* |
| Business and financial | -0.009 | -0.012* | 0.004 | -0.010 | 0.023* | 0.017 | -0.003 | -0.007 | -0.003 | 0.013* |
| Other occupations | 0.003 | 0.009* | 0.010 | 0.007* | -0.012* | 0.002 | 0.002 | -0.003 | 0.001 | -0.002 |
| **Injury Characteristics** | | | | | | | | | | |
| Nature of Injury | | | | | | | | | | |
| Wound | -0.048* | -0.049* | -0.051* | -0.046* | -0.029* | -0.016* | -0.012* | -0.016* | -0.017* | -0.009* |
| Back | -0.001 | 0.004 | 0.016* | 0.004 | 0.023* | 0.010* | 0.011* | 0.017* | 0.010* | 0.015* |
| Pain | 0.014* | -0.021* | -0.013* | -0.004 | 0.010* | 0.010* | -0.013* | -0.000 | -0.003 | 0.004 |
| Other natures | 0.024* | 0.011* | 0.004 | 0.002 | 0.020* | 0.009* | 0.005* | 0.003 | -0.004 | 0.011* |
| Area of Injury | | | | | | | | | | |
| Knee | 0.064* | 0.078* | 0.082* | 0.053* | 0.065* | 0.006* | 0.010* | 0.006 | 0.011* | 0.007* |
| Arm | 0.017* | 0.025* | -0.003 | 0.018* | 0.023* | -0.008* | 0.001 | -0.008* | 0.002 | -0.001 |
| Shoulder | 0.102* | 0.112* | 0.079* | 0.078* | 0.076* | 0.025* | 0.022* | 0.013* | 0.016* | 0.012* |
| Head, external | -0.017* | -0.026* | -0.021* | -0.004 | -0.017* | -0.005* | -0.011* | -0.010* | 0.004 | -0.009* |
| Leg | 0.002 | 0.003 | 0.013* | 0.010* | 0.013* | -0.006* | -0.009* | -0.000 | -0.000 | -0.000 |
| Head, internal | -0.098* | -0.078* | -0.062* | -0.033* | -0.037* | -0.035* | -0.030* | -0.024* | -0.006 | -0.013* |
| Hand | 0.006 | 0.007 | -0.020* | 0.006 | 0.010* | -0.012* | -0.005 | -0.016* | -0.004 | -0.003 |
| Other areas | -0.012* | -0.002 | -0.004 | -0.005 | -0.003 | -0.012* | -0.006* | -0.006* | -0.002 | -0.006* |
| Cause of Injury | | | | | | | | | | |
| Handling mail | -0.013* | -0.018* | -0.018* | -0.004 | -0.004 | -0.003* | -0.007* | -0.014* | -0.003 | -0.001 |
| Handling equipment | -0.022* | -0.015* | -0.019* | -0.011* | -0.012* | -0.008* | -0.009* | -0.008* | -0.005* | -0.008* |
| Slip | -0.017* | -0.016* | -0.002 | -0.002 | -0.007* | -0.007* | -0.009* | -0.004 | -0.004 | -0.007* |
| Animal or insect | -0.087* | -0.093* | -0.052* | -0.070* | -0.068* | -0.027* | -0.028* | -0.012* | -0.025* | -0.029* |
| Other causes | -0.034* | -0.027* | -0.020* | -0.019* | -0.023* | -0.006* | -0.010* | -0.008* | -0.007* | -0.010* |
| Occupational illness | 0.102* | 0.033* | 0.007 | -0.010* | 0.021* | 0.040* | 0.011* | -0.000 | -0.003 | 0.006* |
| Mean Dependent Variable | 0.139 | 0.083 | 0.098 | 0.081 | 0.075 | 0.053 | 0.030 | 0.040 | 0.033 | 0.032 |
| $R^2$ | 0.059 | 0.041 | 0.034 | 0.020 | 0.031 | 0.025 | 0.011 | 0.020 | 0.007 | 0.010 |
| Number of Cases | 327,051 | 133,347 | 93,146 | 78,781 | 168,466 | 327,051 | 133,347 | 93,146 | 78,781 | 168,466 |

Source: FECA Administrative Data, available at http://www.dol.gov/asp/evaluation/AllStudies.htm.

Note: Numbers are coefficients from ordinary least squares estimations of equation (1) except where noted. * indicates a significant ($p \le .05$) coefficient See Table 5 for omitted categories. Location variables were also included in the estimations as controls, but coefficients are not reported here. Full results are available from the authors.

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## Appendix

| Variable | Variable Construction | Number Missing |
|---|---|---|
| **Outcomes** | | |
| Any Disability | An indicator variable equal to 1 if the claimant had any days not working and 0 if no days of not working one year after the injury was reported; claimants are considered not working if they receive disability compensation or are in the DM system and not working in a full-time job | 0 |
| Long-term Disability | An indicator variable equal to 1 if the claimant is receiving disability compensation or is in the disability management system and not at a full-time job one year after the injury was reported and 0 otherwise | 0 |
| **Demographic Characteristics** | | |
| Female | An indicator variable equal to 1 if the claimant is female and 0 otherwise | 85 |
| Age in Years | The number of days from the report date and the claimant's birth date, divided by 365.25, and rounded to the nearest number; cases with values outside the 99th percentile of the age distribution (that is, an age younger than 14 or older than 68) are coded as missing | 7,792 |
| Has Dependents | An indicator variable equal to 1 if the claimant has dependents and 0 otherwise | 0 |
| **Employment Characteristics** | | |
| **Occupation** Occupations are coded using a cross-walk from the Occupational Safety and Health Administration-coded occupations in the database to the 2000 Standard Occupation Classification system. The six occupations included represent at least 5 percent of injuries with nonmissing occupation codes. | | |
| Business and financial | An indicator variable equal to 1 if the two-digit occupation code is business and financial operations occupations and 0 otherwise | 229,213 |
| Healthcare | An indicator variable equal to 1 if the two-digit occupation code is health care practitioners and technical occupations and 0 otherwise | 229,213 |
| Installation, maintenance, and repair | An indicator variable equal to 1 if the two-digit occupation code is installation, maintenance, and repair occupations and 0 otherwise | 229,213 |
| Office and administrative support | An indicator variable equal to 1 if the two-digit occupation code is office and administrative support occupations and 0 otherwise | 229,213 |
| Postal service workers | An indicator variable equal to 1 if the five-digit occupation code is postal service workers and 0 otherwise | 229,213 |
| Protective service | An indicator variable equal to 1 if the two-digit occupation code is protective service worker and 0 otherwise | 229,213 |
| Other occupations | An indicator variable equal to 1 if the two-digit occupation code is not listed above and 0 otherwise | 229,213 |
| **Employing Department** Options include the U.S. Departments of Agriculture, Commerce, Defense, Education, Energy, Health and Human Services, Homeland Security, Housing and Urban Development, Justice, Labor, State, Interior, Transportation, Treasury, Veterans Affairs, Environmental Protection Agency, Executive Office of the President, Government Printing Office, National Aeronautics and Space Administration, Peace Corps, Social Security Administration, Tennessee Valley Authority, or the United States Postal Service. The four departments identified represent at least 5 percent of all injuries. | | |
| Defense | An indicator variable equal to 1 if the employing department is the Department of Defense and 0 otherwise | 0 |
| Homeland Security | An indicator variable equal to 1 if the employing department is the Department of Homeland Security and 0 otherwise | 0 |
| Veterans Affairs | An indicator variable equal to 1 if the employing department is the Department of Veterans Affairs and 0 otherwise | 0 |

| Variable | Variable Construction | Number Missing |
|---|---|---|
| U.S. Postal Service | An indicator variable equal to 1 if the employing department is the United States Postal Service and 0 otherwise | 0 |
| Other Departments | An indicator variable equal to 1 if the employing department is listed above and 0 otherwise | 0 |
| **Injury Characteristics** | | |
| Nature of Injury | The four natures identified represent at least 5 percent of all injuries with nonmissing natures of injury | |
| Back | An indicator variable equal to 1 if the nature of the injury is back sprain/strain, back pain, subluxation or back sprain/strain, back pain, or subluxation or invertebratal disc disorder and 0 otherwise | 123,758 |
| Pain | An indicator variable equal to 1 if the nature of the injury is pain/swelling/stiffness/redness in joint or pain/swelling/stiffness/redness not in joint and 0 otherwise | 123,758 |
| Sprain | An indicator variable equal to 1 if the nature of the injury is sprain/strain of ligament, muscle, tendon, or not back and 0 otherwise | 123,758 |
| Wound | An indicator variable equal to 1 if the nature of the injury is contusion, laceration, superficial wounds, or puncture wound and 0 otherwise | 123,758 |
| Other natures | An indicator variable equal to 1 if the nature of the injury is not listed above and 0 otherwise | 123,758 |
| Area of Injury | The eight areas identified represent at least 5 percent of all injuries with nonmissing areas of injury | |
| Arm | An indicator variable equal to 1 if the area of the injury is the arm and 0 otherwise | 2,008 |
| External (trunk area) | An indicator variable equal to 1 if the area of the injury is external and in the trunk area and 0 otherwise | 2,008 |
| Hand | An indicator variable equal to 1 if the area of the injury is the hand and 0 otherwise | 2,008 |
| Head, external | An indicator variable equal to 1 if the area of the injury is external to the head and 0 otherwise | 2,008 |
| Head, internal | An indicator variable equal to 1 if the area of the injury is internal to the head and 0 otherwise | 2,008 |
| Knee | An indicator variable equal to 1 if the area of the injury is the knee and 0 otherwise | 2,008 |
| Leg | An indicator variable equal to 1 if the area of the injury is the leg and 0 otherwise | 2,008 |
| Shoulder | An indicator variable equal to 1 if the area of the injury is the shoulder and 0 otherwise | 2,008 |
| Other areas | An indicator variable equal to 1 if the area of the injury is not listed above and 0 otherwise | 2,008 |
| Cause of Injury | The causes identified represent at least 5 percent of all injuries with nonmissing causes of injury | |
| Animal or insect | An indicator variable equal to 1 if the cause of the injury is animals/insects or dog bite and 0 otherwise | 238,787 |
| Fall | An indicator variable equal to 1 if the cause of the injury is fall on floor/work surface/aisle; fall on stairway or steps; fall on walkways/curbs/porches, fall from scaffold or platform; fall from ladder; fall from chair/stool/rest bar; fall from desk/table/workbench; fall into hole/hatch/chute; fall on deck; fall on road/highway/street; fall from stacked cargo; fall on hill or slope; fall from ramp/runway/gangplank; fall off dock; fall from machinery; fall from stopped vehicle; fall getting on/off elevator; fall inside moving vehicle; or fall and 0 otherwise | 238,787 |
| Handling mail | An indicator variable equal to 1 if the cause of the injury is handling | 238,787 |

| Variable | Variable Construction | Number Missing |
|---|---|---|
| | packaged material, weight stated; handling packaged material, weight not stated; handling mail containers; or handling magazines or papers and 0 otherwise | |
| Handling equipment | An indicator variable equal to 1 if the cause of the injury is handling manual equipment and 0 otherwise | 238,787 |
| Slip | An indicator variable equal to 1 if the cause of the injury is slip—not falling or slip/twist/trip—not falling and 0 otherwise | 238,787 |
| Other causes | An indicator variable equal to 1 if the cause of the injury is not listed above and 0 otherwise | 238,787 |
| Type of Injury | | |
| Traumatic injury | An indicator variable equal to 1 if the claimant has a traumatic injury and 0 otherwise | 0 |
| Occupational illness | An indicator variable equal to 1 if the claimant has an occupational illness and 0 otherwise | 0 |
| **Services** | | |
| Compensation | Total amount of compensation for lost wages paid to claimant in the first year after the injury (in January 2005 dollars) | 0 |
| Medical Payments | Total payments to physicians, hospitals, and pharmacies for covered medical services in the first year after the injury (in January 2005 dollars) | 0 |
| **Included in analyses but suppressed in tables** | | |
| Boston | Twelve indicator variables with each variable equal to 1 to designator an office processing the claim and 0 otherwise. Indicator variables include Boston (Connecticut, Maine, Massachusetts, New Hampshire, Rhode Island, and Vermont), Chicago (Illinois, Minnesota, Wisconsin), Cleveland (Indiana, Michigan, Ohio), Dallas (Louisiana, Oklahoma, and Texas), Denver (Colorado, Montana, New Mexico, North Dakota, South Dakota, Utah, and Wyoming), Jacksonville (Alabama, Florida, Georgia, Kentucky, Mississippi, North Carolina, South Carolina, and Tennessee), Kansas City (Arkansas, Iowa, Kansas, Missouri, and Nebraska; all employees of the Department of Labor, except Job Corps enrollees, and their relatives), New York (New Jersey, New York, Puerto Rico, and the Virgin Islands), Philadelphia (Delaware, Pennsylvania, and West Virginia; Maryland if the zip code of the claimant's residence begins 21), San Francisco (Arizona, California, Hawaii, and Nevada), Seattle (Alaska, Idaho, Oregon, and Washington), and Washington, DC (District of Columbia, Virginia; Maryland when the zip code of the claimant's residence is other than 21) | 0 |